ONTARIO MINISTRY OF ENVIRONMENT
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SEPTIC TANK SYSTEMS

PRIVATE WASTE AND WATER MANAGEMENT BRANCH

ONTARIO

MINISTRY OF THE ENVIRONMENT

Honourable James A. C. Auld, Minister

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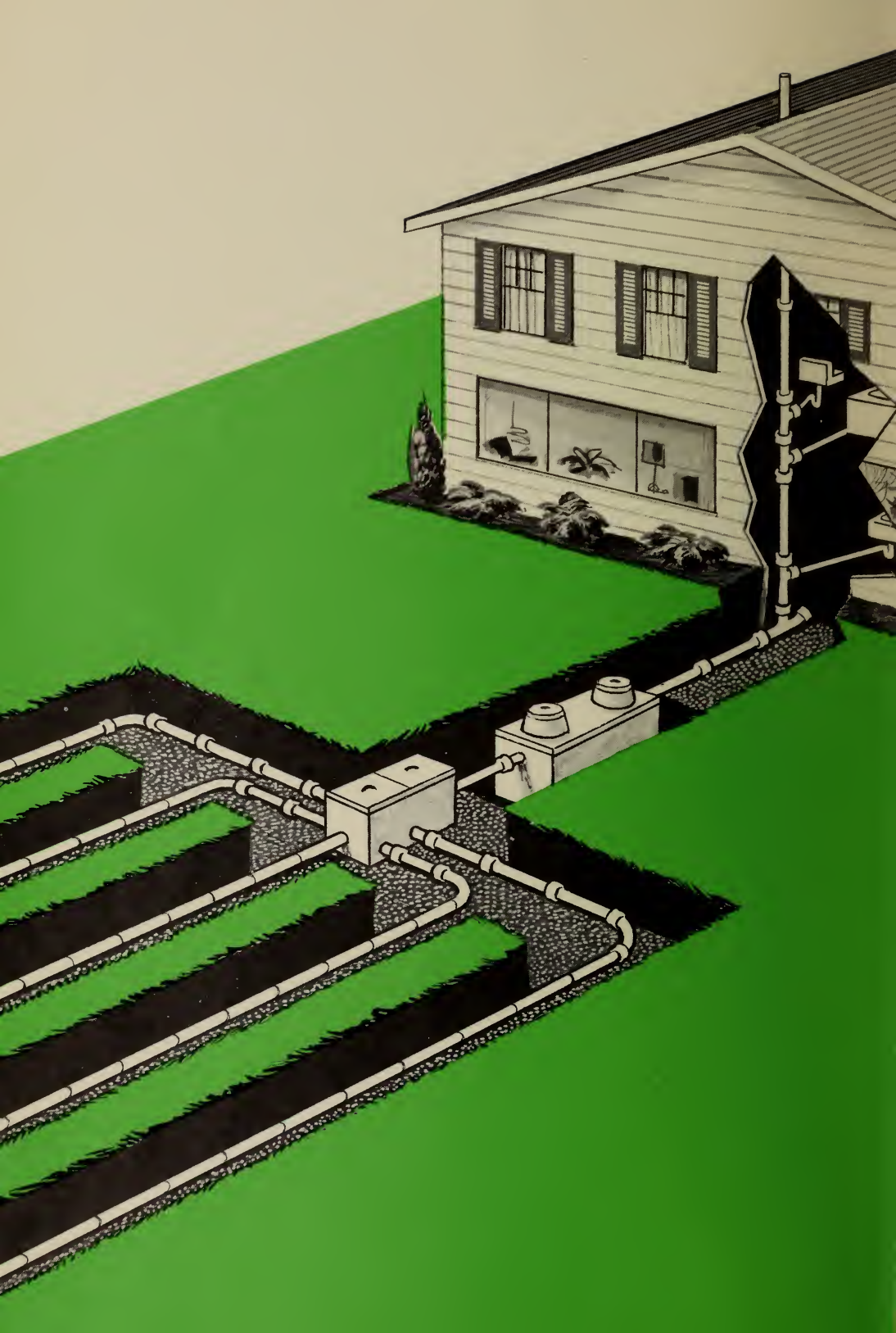

SEPTIC TANK SYSTEMS

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FOREWORD

Ontario continues to grow rapidly, not only in urban areas where central sewerage is available, but also in rural areas where individual sewage systems must be used. In 1970, over 30,000 new lots were approved for residential or other development in unsewered areas of the Province. Most of the dwellings, cottages and small business establishments to be built on these lots will have a piped water supply with various plumbing fixtures carrying away the used water.

The sewage system for any of these establishments will be required to dispose of all the water piped into the building. After water is used and discharged into a plumbing fixture it becomes sewage. It may even contain dangerous bacteria or viruses if there is illness among persons using the plumbing system.

In a dwelling many substances are in use which get into the waste from fixtures such as kitchen sinks, shower baths, laundry tubs, dishwashing machines, and toilets. These substances become contaminants in the waste water. They may include detergents, soaps, greases, food particles, cleaners, bleaches, ammonia, polishes, solvents, insect sprays, tooth paste, various body fluids, feces, and other offensive, dangerous, or putrescible substances. All of these substances require careful disposal to protect human health and the natural environment. Inadequately treated sewage should not be permitted to appear on the surface of the ground, to flow in open ditches, or to drain directly into streams, ponds, lakes or marshy areas.

One of the most satisfactory systems for individual sewage treatment is the septic tank system. This booklet describes how it is installed and how it works.

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THE DISPOSAL OF SEWAGE

People who live in an urban community seldom have to give much thought to the disposal of wastes from their homes. A public sewerage system and sewage treatment plant, usually operated and maintained by the municipality, removes such wastes and disposes of them after proper treatment and disinfection. In unsewered areas, however, sewage disposal becomes the responsibility of each householder. Similarly, the owner of an apartment block or commercial premises, the school board, and in fact everyone in an unsewered area who owns or operates premises in which liquid wastes are produced is responsible for their disposal.

This booklet is mainly concerned with the septic tank and soil absorption method which is only one of a number of ways of dealing with the problem of sewage disposal. It was originally developed for isolated households in rural areas. A typical instance would be a farm home having a well water supply with perhaps less water being used and hence smaller waste flows resulting than in a modern urban home connected to the public water system providing an ample supply. Other methods of sewage treatment and disposal such as lagoons and package treatment plants are also available but are not covered in this booklet.

A correctly designed and constructed sewage disposal system will function effectively and safely, but a system which is badly designed and located, or badly constructed, can lead to considerable nuisance and expense, and may seriously endanger health. In particular, the installation must be so planned and built that surface and ground water supplies do not become polluted and that sewage does not pond on the surface thereby creating the hazard of communicable disease transmission by flies or by direct contact. If this hazard is not avoided, diseases such as typhoid fever, paratyphoid fever, dysentery and some of the virus diseases including infectious hepatitis can be spread.

For a septic tank system to function effectively, consideration must be given to the available land area, type and thickness of soil over the ground water table, and rock formations. Other factors include proximity to well water supplies, lakes, streams and other watercourses.

HOW TO USE THIS BOOKLET

Part I outlines the legal requirements involved in the use of domestic septic tank systems, describes how such systems work, and provides guidance on the selection of a suitable location for a system. Drawings and tables are included to assist in selecting the required size of the septic tank and the tile field.

Part II deals with private sewage disposal facilities for schools, institutions, apartment blocks, motels, restaurants and other commercial premises where sewage quantities are greater than those from a single family residence and where the rate of flow and the nature of the sewage

can vary considerably. In these instances, larger and more complex treatment facilities are frequently required and their design should be entrusted to a professional engineer or architect *with experience in this field.*

PART I

DOMESTIC SYSTEMS

1. The law relating to household sewage disposal

Wherever your property is situated in Ontario, provincial law requires that you obtain permission in writing to establish a septic tank system. Aside from this legal requirement, it is in your best interest to get advice *before* you start to build, because the sewage disposal system may be the determining factor in establishing the location and ground floor elevation of your house or other building.

In some areas, approval is given by the local Medical Officer of Health, and in others by the Regional Engineer of the Ministry of the Environment. Local representatives of the Board of Health or of the Ministry of the Environment will be able to tell you who is responsible in any particular area for approving septic tanks.

2. How a septic tank system works

The purpose of a septic tank system is to return to the soil the sewage and other liquid wastes from the household in such a manner that ground water does not become polluted and no sewage appears at the ground surface. The system consists essentially of two main parts:

- The septic tank which by settling out solids, prepares the sewage for absorption by the soil.
- The tile field which distributes the liquid to the soil.

The purpose of the septic tank is frequently misunderstood. Its main function is to remove from the waste, solids which could not be absorbed by the soil in the tile field. Little purification takes place in the septic tank, and the liquid effluent from the tank can be as highly polluted as the waste which entered it. Bacterial action breaks down much of the solid matter to liquids and gases, and in an efficiently operating tank only a liquid is discharged to the tile field and thence into the soil. Sufficient capacity is provided in the tank for the retention of insoluble matter. The removal, when necessary, of sludge and scum from the tank should ensure its continued efficient operation. This work is best carried out by persons operating a septic tank maintenance service.

The second part of the system — the tile field — consists of pipes laid with open joints in trenches so that the liquid wastes can pass into the soil where further bacterial action occurs, helping to purify the effluent so as not to pollute ground or surface water.

3. General considerations

It will be seen that the design of a septic tank system depends mainly on two factors:

1. The strength and quantity of sewage to be disposed of.
2. The ability of the soil to absorb the liquified waste.

The wastes to be disposed of by the septic tank system are sewage from toilets, waste water from the kitchen, and the waste from baths, washbasins, showers, sinks, and washing machines. Where garbage grinders are used, the waste from these units should also be discharged to the septic tank. Surface water from roofs and yards, and foundation drainage must be excluded from the septic tank system and the tile field area.

The suitability of the soil for absorbing the liquid waste is estimated by a soil percolation test. Sandy soils will, of course, absorb liquid more readily than soils containing clay. Consequently, the length of tile trench to be provided, which depends on the permeability, will increase with the clay content of the soil.

Septic tanks must be completely watertight. Tanks are usually made of concrete, coated steel or other materials such as glass fiber-reinforced plastic. Concrete is the preferred material because of its proven durability.

The tank should be either rectangular or cylindrical in cross section with the long axis horizontal. The former shape is preferable for a concrete tank and the latter for a coated metal tank. For concrete tanks which are poured in place, a greater wall thickness is usually required than with the pre-cast units due to the absence on the building site of the degree of quality control provided at the factory where pre-cast units are made.

If a rectangular tank is used, best results are obtained if the length is between two and three times the width. Some improvement in efficiency is obtained if the tank is divided into two sections, with the first being about twice as long as the second. The depth of the liquid (that is from the bottom of the tank to the level of the outlet) should be 4 feet to 4 feet 6 inches. An additional foot of depth above the water surface is required for ventilation purposes and for floating scum storage. Refer to Drawing No. 2 for construction details.

A septic tank may be fitted with a siphon which automatically discharges the correct volume of sewage to the entire tile field and prevents "dribble flows" which may use only a portion of the field. A siphon has the further advantage that it assists in preventing the system from freezing up in extremely cold weather in localities where this might otherwise occur.

A 3-inch siphon is adequate for a domestic septic tank. The manufacturer's installation instructions should be rigidly followed, particularly in regard to the correct drawing depth to be provided in the siphon chamber to operate the particular make of siphon to be installed. The discharge from the siphon depends on the size of the siphon chamber, and the amount of liquid discharged should be equal to two-thirds to three-quarters of the volumetric capacity of the field tiles. For this capacity, refer to the Chart No. 3 and data on page 21. The use of a siphon involves special considerations in the design and location of the septic tank system as a siphon will require an increase in the minimum difference in elevation or fall which must be available from the building to the tile field. This extra fall depends on the size and make of siphon and can be obtained from the manufacturer.

4. Locating a septic tank system

A septic tank should not be closer than:

- 50 feet to any well, lake, stream or pond
- 5 feet to any building
- 10 feet to any property boundary.

The tile field should not be closer than:

- 100 feet to the nearest dug well
- 50 feet to a drilled well which has a casing to 25 feet below ground
- 25 feet to a building
- 10 feet to a property boundary
- 50 feet to any lake, stream or pond.

This is illustrated on Drawing Number 1 — General Layout.

The above distances should be considered as minimal. Such factors as slope of ground, type and thickness of soil, exposed rock areas and other physical conditions, will affect these distances and must receive appropriate attention.

The ideal location for a tile field is in a well drained, sandy loam soil, remote from any wells or other drinking water sources. For the tile field to work satisfactorily the following condition should exist:

The maximum elevation of the ground water table, or of any rock formation or layer of impervious material should be not less than 3 feet below the bottom of the tile trenches.

Some localities may require more than the minimum distance indicated here.

Should a water pipe from a municipal service or from a private supply pass close to a septic tank or tile field, special care should be taken to prevent any possibility of sewage entering the pipe due to seepage and infiltration through faulty joints or cracks.

5. The soil seepage or percolation test (see also section 3)

(a) At least 4 separate tests (which can run concurrently) should be carried out at points selected over the whole of the proposed tile field site.

(b) Dig a hole about 1 ft. square. Alternatively, this hole could be bored with a 4-inch earth auger to the level of the proposed trench bottom.

(c) Remove all loose material or smeared clay from the sides and bottom and add two inches of coarse sand or fine gravel to protect the bottom from scour and sediment.

(d) Fill the test hole with clear water to a minimum depth of 12 inches over the gravel. Keep this supply replenished until the water seeps

away at a constant rate. The test holes should be kept filled with water for at least 24 hours to make sure that the soil is thoroughly saturated and any swelling has taken place. A false impression of the capacity of the soil to receive sewage will be obtained if it is not properly saturated when the test is carried out.

(e) Wait until the soil has become saturated so that the rate of drop of the water level is constant and then with about 12 inches depth of water in the hole, observe the time required for the water to drop 1 inch. This is the standard percolation time "t", referred to in the table which follows, and in the charts in the second part of the booklet. The measurement of "t" is most easily carried out by using a measured stick graduated in inches which is placed vertically in the hole, its end just touching the water surface. If another board or straight edge is placed across the top of the hole, the time for a 1 inch drop in the water surface can easily be measured by observing the graduations on the vertical stick.

6. Planning a septic tank system

Steps in planning a system are:

(a) Consult the appropriate official for local requirements.

(b) Select the site for the tank and the tile field (see section 3 above and Drawing No. 1).

Table No. 1

Percolation Rates Time "t" in minutes for water to fall 1"	No. of feet of 18" wide trench per bedroom (Allowing two persons per bedroom)
1	20 (But not less than 150' total)
5	44 " "
10	64 " "
20	90 " "
30	110 " "
40	126 " "
50	140 " "
60	154 " "
Over 60	Not suitable for subsurface absorption

Notes: 1. This table is for domestic systems only. It does NOT apply to schools, motels, hospitals or other such premises.

2. The length of the trench must be increased where a garbage grinder is to be connected. The increase can be determined from the chart in Part II.

3. Percolation tests need not be done where the entire soil absorption site is composed of clean sand and gravel. In such cases "t" may be assumed to be equal to 20 minutes.

(c) Choose a tank size from the table on page 12. Note that no septic tank should be of less than 500 gallons capacity. (Use number of bedrooms as design basis.)

(d) Carry out the soil seepage test (see section 5 above).

(e) Calculate the length of tile trench required according to the number of bedrooms from Table 1 or the chart on page 21 (no tile field should have less than 150 feet of 18 inch wide trench and tile). Some localities will have pre-determined requirements and may stipulate the size of the tile field.

(f) Refer to Table 3 on page 12 for the size of the siphon chamber if one is to be used.

(g) Prepare a plan and submit this to the appropriate official for approval.

7. Operation and maintenance of septic tank systems

People often ask whether certain types of waste may be discharged safely to a septic tank system and whether a grease trap is necessary. For normal domestic systems, to which Part I of this booklet refers, no grease trap will be necessary for the small amount of grease coming from the kitchen. Similarly, detergents, lye, or other household cleansers or disinfectants in the quantities normally used should not hinder the bacterial action in the septic tank. Care should be taken, however, to ensure that excessive quantities of these materials do not enter the system. Waste discharges from household water softener units appear to have no adverse effect on the action of the septic tank, but may cause a slight shortening of the life of a tile field installed in certain clay type soils. When installing a water softener extreme care should be taken in connecting these units to the disposal system to preclude any danger of cross connection between the water supply and the waste plumbing system.

Various preparations are on the market which are said to start, accelerate or improve the action in the septic tank. Apart from these proprietary products it is often suggested that yeast would help the action. There appears to be no necessity for the addition of any such product to the septic tank system. All bacteria necessary for the operation are already contained in the sewage entering the system.

Trouble is sometimes experienced with septic tank systems after large house parties have been held. During such periods abnormal quantities of liquid reach the system, which results in overloading. This may also occur because of flooding of the surface of the tile bed area due to lawn watering, surface or roof drainage or because of faulty valve closure. These should be avoided.

With proper construction and operation a septic tank system will need very little maintenance. With the tank capacities previously given, it should not be necessary to pump out the tank more than once every three years. It should, however, be inspected at least once a year and pumped out when necessary. Failure to pump out a septic tank when required may

result in sludge or scum being carried into the tile field which in turn will clog and cease to function. In this event not only will the tank have to be pumped out but the tile field may have to be replaced.

Inspection of the sludge and scum accumulation is the only way to determine when a tank should be pumped out. This is indicated if either:

(a) the bottom of the scum mat is within approximately 3 inches of the bottom of the outlet fitting, or

(b) the surface of the sludge accumulation comes within 18 inches of the outlet fitting.

In most localities there are contractors who will pump out septic tanks. Tanks should not be washed or disinfected after pumping. A small amount of sludge should be left in the tank for seeding purposes. The means and place of disposal of the contents of the tank must be approved by the local authority.

Summer cottage owners should have their septic tanks pumped out to within 6″ of the bottom when the cottage is closed for the season. The entire drainage system and water system should be emptied. Traps should be refilled with kerosene or anti-freeze over the winter to prevent the entry of rodents.

A tile field can be damaged by vehicular traffic, blocking by root growth, and freezing.

No wheeled or tracked vehicle should ever be allowed in the tile area even during construction. If necessary, the tile area should be fenced off.

It is much easier to prevent root trouble than to cure it. Provided no bushes or large plants and nothing other than grass is grown over the tile field, there should be no trouble from roots. Systems heavily blocked by roots may have to be cleared by a plumber using the proper tools for the purpose.

In northern or exposed locations the installation of a siphon as previously described will reduce the risk of freezing of the tile field.

8. Alternative methods for distribution and tile fields

It is suggested in an Addendum to the "Septic Tank Manual", Publication No. 526 of the Public Health Service, U.S. Department of Health, Education and Welfare, that serial distribution may offer several advantages by minimizing the importance of variable absorption rates over a confined area so that varying physical and chemical characteristics of the soil have less effect on the efficiency of operation. It is also pointed out that serial distribution causes each trench in the absorption system to be used to its full capacity before failure occurs and that the cost of the distribution box can be eliminated. The following data and diagrams relating to a modified arrangement of the tile field are taken from the above-noted Addendum.

(a) Flat Areas — a minimum of 12 inches of earth cover to be provided over the gravel fill in all trenches of the system.

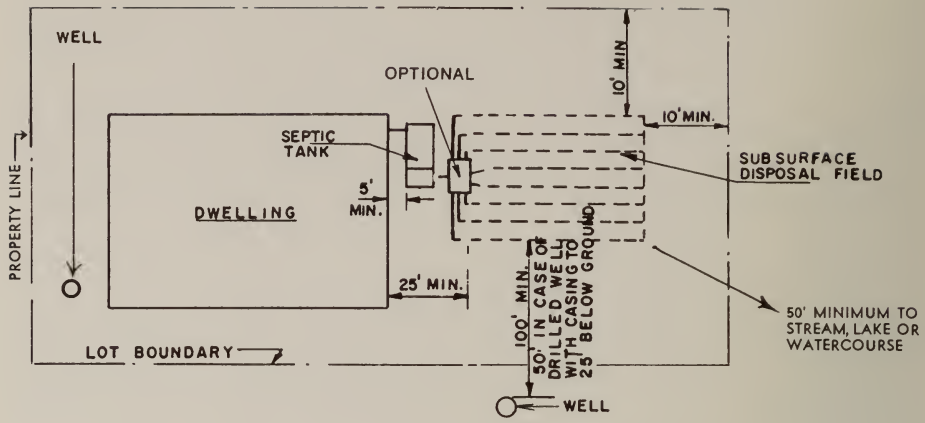
- The bottom of the trenches and distribution lines to be constructed on a relatively level grade.
- Other construction features of the disposal field to be the same as recommended in the other sections of this publication.

(b) Tile fields on sloping ground — serial distribution may be used in all situations where a soil absorption system is permitted and should be used where the fall of the ground surface exceeds approximately 6 inches in any direction within the area utilized for the tile field.

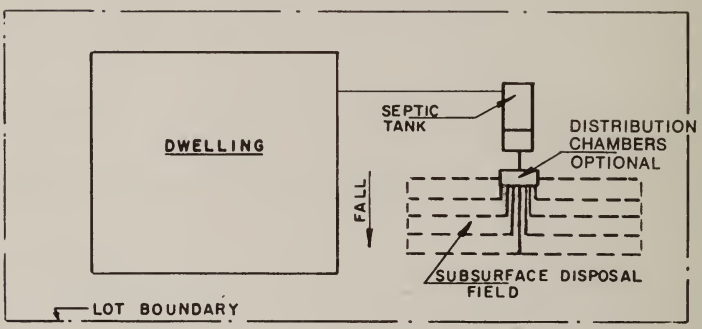
In serial distribution each trench or pair of trenches is connected to the next by a tightly jointed relief line laid on an undisturbed section of ground as shown on Drawing No. 6 on Page 15. The arrangement is such that all effluent is discharged to the first trench until it is filled. Excess liquid is then carried by means of a tightly jointed line to the succeeding or lower trench. In that manner each portion of the tile trench is used in succession. When serial distribution is used the following design and construction procedures should be followed:

1. The amount of tile trench required shall be the same as shown in Table No. 1 on Page 6 of this booklet.
2. The bottom of each trench and its distribution tile should have a relatively level grade.
3. The direction of the tile trenches should follow approximately the ground surface contour lines so that variations in trench depth will be minimized.
4. There should be a minimum of 12 inches of ground cover over the gravel fill in the trenches.
5. There should be a minimum of six feet of undisturbed earth between adjacent trenches.
6. Adjacent trenches may be connected with a relief line with or without a drop box arrangement as shown on Drawing No. 6 on Page 15 in such a manner that each trench is completely filled with septic tank effluent to the full depth of the gravel before effluent flows to succeeding trenches. Trench connecting lines should be 4 inches tightly jointed sewer pipe with direct connections to the distribution lines in adjacent trenches or to a drop box arrangement. Care must be exercised in constructing relief lines to insure an undisturbed block of earth between trenches. The relief lines should rest on undisturbed earth and backfill should be carefully tamped. The relief lines connecting individual trenches should be as far from each other as practicable in order to prevent short-circuiting.
7. The level of the overflow pipe in the first relief line must be at least 4 inches lower than that of the septic tank outlet.
8. All other construction features of the disposal field should be as detailed in this booklet.

DRAWING No. 1



TYPICAL LAYOUT OF SEPTIC TANK AND TILE FIELD
(GROUND FAIRLY LEVEL)



ALTERNATE LAYOUT OF SEPTIC TANK AND TILE FIELD

NOTES:

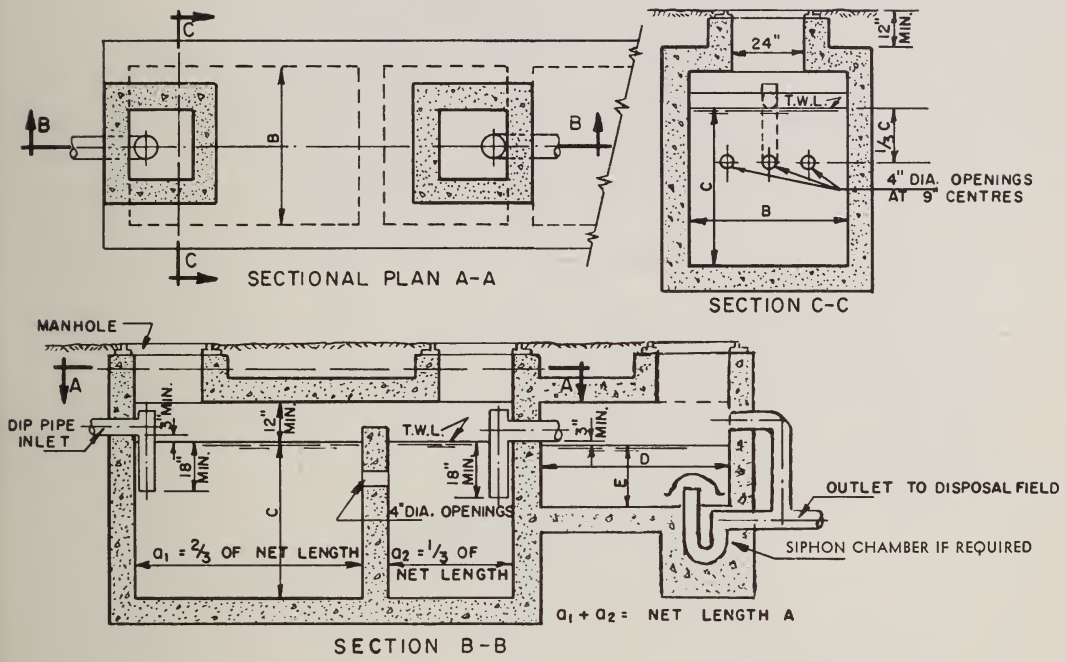
1. The above layouts are suitable for well drained soil as determined by percolation tests. For other soils, alternative methods of disposal of the septic tank effluent may be necessary.
2. Location of tank and tile field to be on lower ground than adjacent wells, etc. if possible.
3. Internal plumbing and main drainage outlet should be designed with a view to connecting to possible future sanitary sewers.
4. Roof water, surface water, discharge from footing drains, etc. to be excluded from entry to septic tank.
5. Tile fields not to be located in swampy ground or in ground liable to flooding.
6. Inspect tanks annually. Clean the tank when combined depth of sludge and scum layers is $1/3$ the depth C (see drawing 2).

SEPTIC TANK SYSTEMS

GENERAL LAYOUT

NOT TO SCALE

DRAWING No. 2



TWO COMPARTMENT SEPTIC TANK AND SIPHON CHAMBER PLAN AND SECTIONS

NOTES:

1. Performance of tanks is usually improved if divided into two compartments as shown. Total capacity remains the same as for a single compartment tank.
2. Manhole access should be provided to each compartment.
3. Baffles may be used at inlet and outlet of tank instead of dip-pipes. These should extend the full width of the tank, top edge not less than 6" above T.W.L. and bottom edge not less than 18" below T.W.L. See alternative details.
4. Inlet pipe may enter side wall of tank if convenient, but centre-line of pipe must not be more than 6" from inlet end wall.
5. The slope of the inlet pipe should be such that inlet velocity does not exceed 3 feet per second (1" in 6 ft. for 4" dia. pipe; 1" in 12 ft. for 6" dia. pipe).
6. Provision should be made for not less than 12" of cover to tank (this may be raised above general ground level when available fall to distribution system is limited).
7. A siphon chamber should be included where 500 feet of tile trench or over are required. This chamber should contain enough sewage to fill the tiles ⅔ to ¾ full. A chamber of 20-25% of total tank capacity will normally meet this requirement.
8. Dimension E given as guide only. See also manufacturer's requirements.
9. Add 12" to dimension C for total internal depth.
10. For dimensions A, B, C, D and E see Tables Nos. 2 and 3.

SEPTIC TANK SYSTEMS

CONSTRUCTION DETAILS

NOT TO SCALE

TABLE No. 2

RECOMMENDED DIMENSIONS OF SEPTIC TANKS				
Number of Bedrooms	Settling Compartments (Combined capacity)			Capacity (Imperial gallons)
	Length A ($A=a_1+a_2$)	Width B	Water Depth C	
2 or less	6'-9"	3'-0"	4'-0"	* 500
3	8'-0"	3'-0"	4'-0"	600
4	9'-0"	3'-3"	4'-0"	720
5	9'-0"	3'-6"	4'-6"	900

* Minimum size of tank.

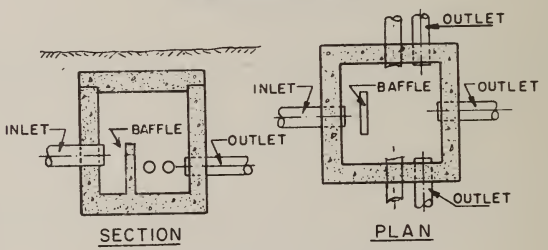
The above dimensions are calculated for households having an automatic washer but no garbage grinder. If a garbage grinder is used, tank capacity should be increased by 20%. Probable future usage of these machines should be taken into account when tank is designed.

Siphon chamber dimensions given are approximate, but are suitable in normal circumstances. The water depth E, however, depends on the siphon used. Consult the supplier. The volume of sewage held should be 2/3 to 3/4 of the volume of the tiles in the disposal field. The volume of 100 ft. of 4" dia. tile is 55 gallons, or 8¾ cubic ft. Therefore approximately 40 gallons per 100 ft. of tile should be provided for in the siphon chambre design.

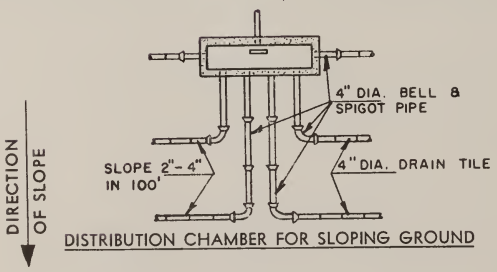
TABLE No. 3

SIPHON CHAMBER DIMENSIONS		
Number of Bedrooms	Length D	Water Depth E
2 or less	4'-6"	1'-6"
3	5'-6"	1'-6"
4	6'-0"	1'-6"
5	6'-6"	1'-6"

DRAWING No. 3



OPTIONAL DISTRIBUTION CHAMBERS



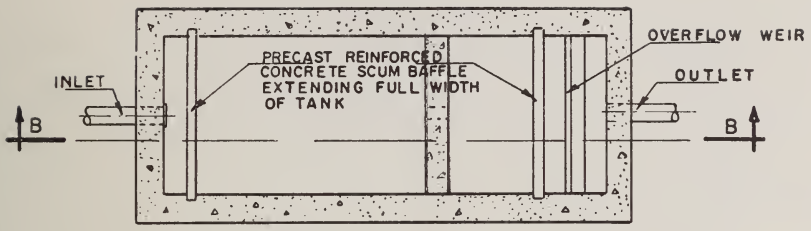
DISTRIBUTION CHAMBER FOR SLOPING GROUND

SEPTIC TANK SYSTEMS

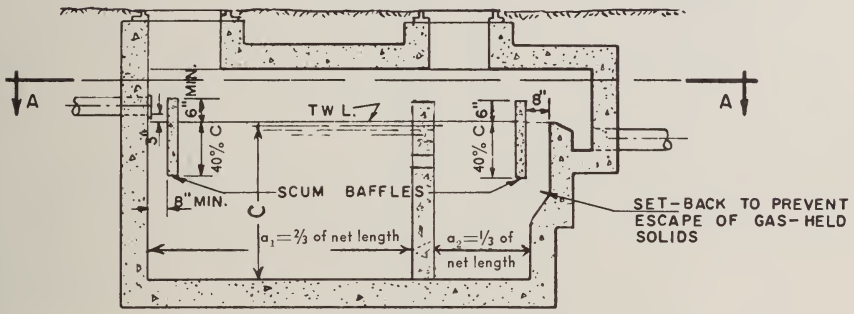
SEPTIC TANK DIMENSIONS AND DISTRIBUTION CHAMBER DETAILS

NOT TO SCALE

DRAWING No. 4

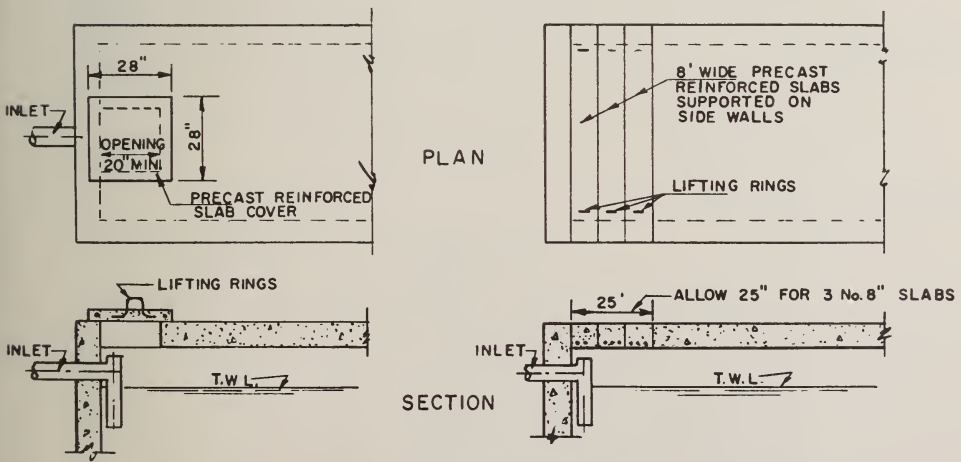


SECTIONAL PLAN A-A



SECTION B-B

SEPTIC TANK. ALTERNATIVE ARRANGEMENT OF INLET AND OUTLET



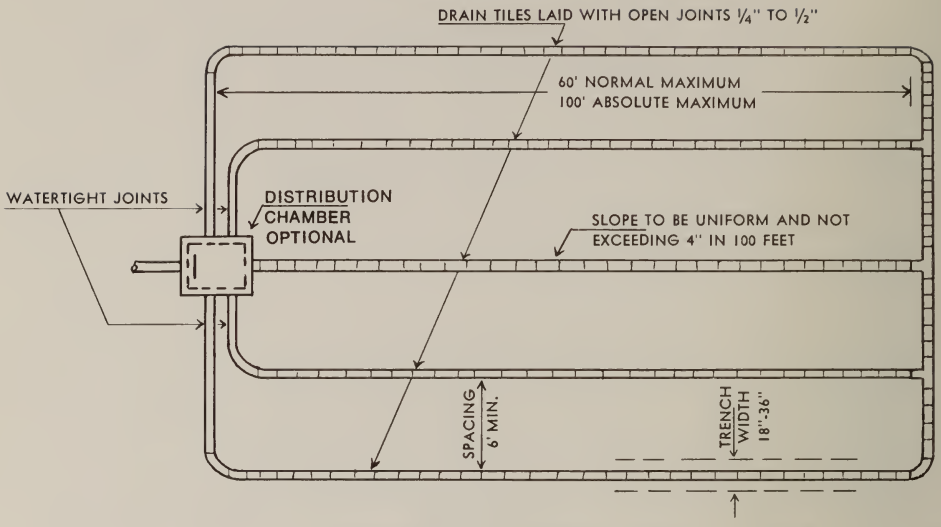
ALTERNATIVE MANHOLE ACCESS OPENINGS AND COVERS

SEPTIC TANK SYSTEMS

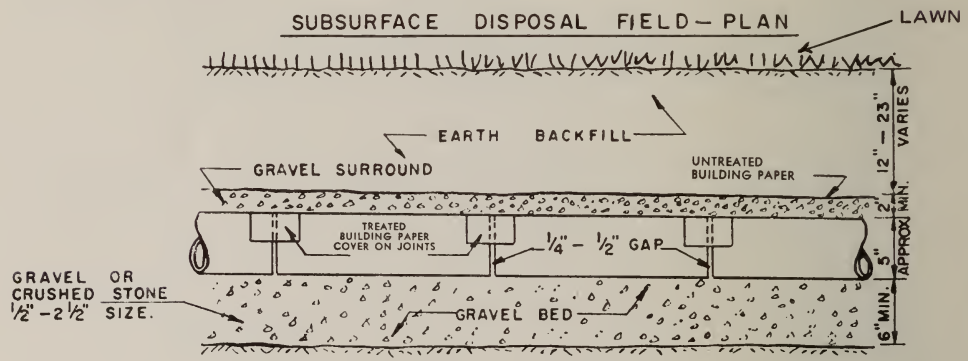
ALTERNATIVE CONSTRUCTION

NOT TO SCALE

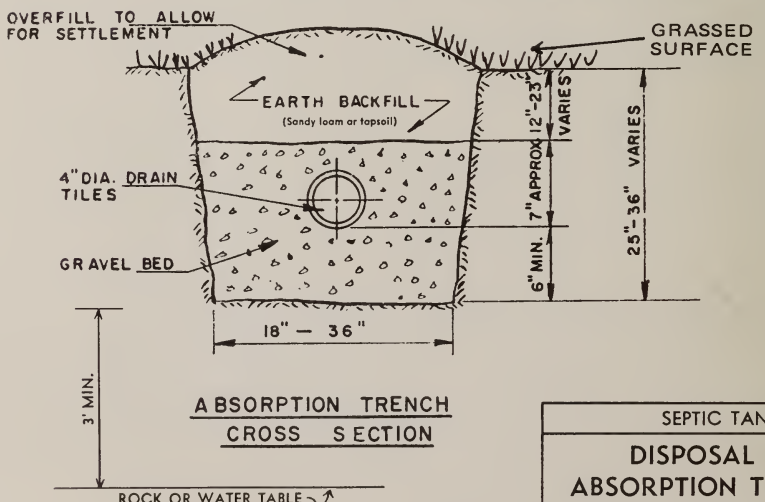
DRAWING No. 5


DRAIN TILES LAID WITH OPEN JOINTS 1/4" TO 1/2"
60' NORMAL MAXIMUM
100' ABSOLUTE MAXIMUM
WATERTIGHT JOINTS
DISTRIBUTION CHAMBER OPTIONAL
SLOPE TO BE UNIFORM AND NOT EXCEEDING 4" IN 100 FEET
SPACING 6' MIN.
TRENCH WIDTH 18"-36"

SUBSURFACE DISPOSAL FIELD — PLAN



ABSORPTION TRENCH — LONGITUDINAL SECTION



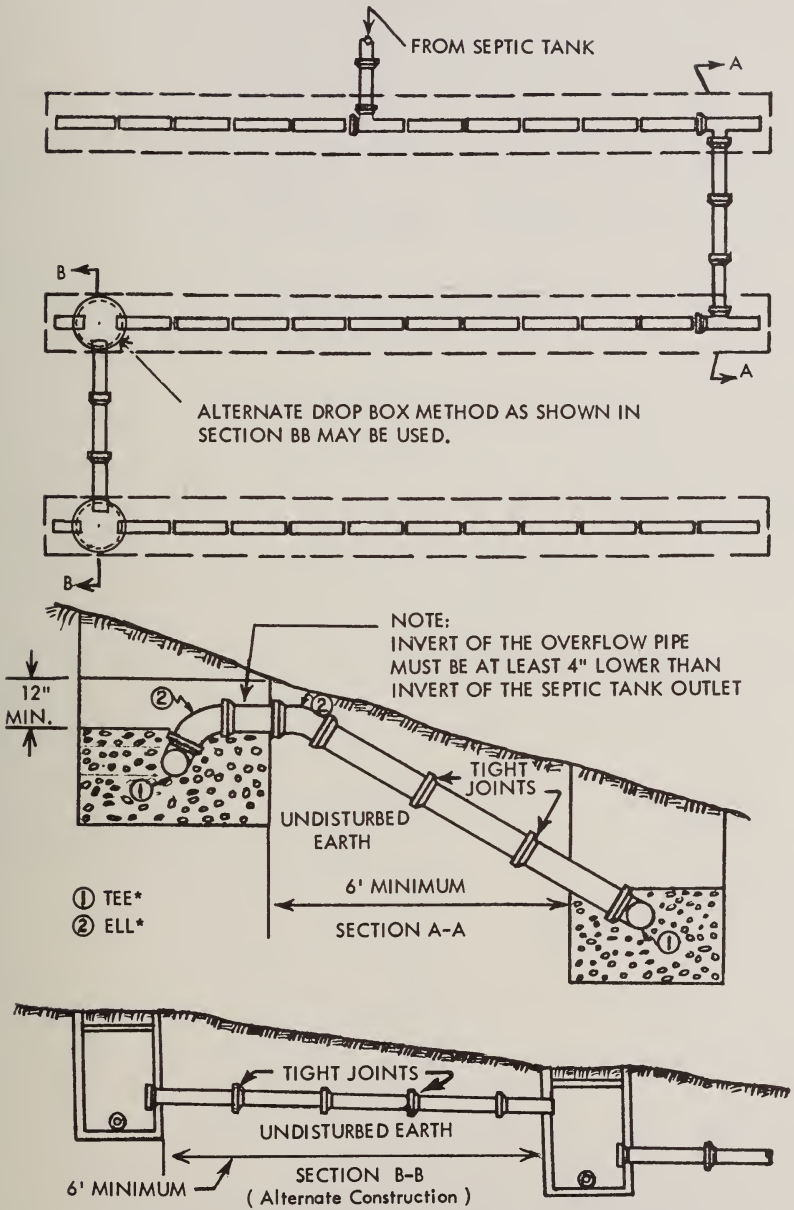
ABSORPTION TRENCH CROSS SECTION

SEPTIC TANK SYSTEMS

DISPOSAL FIELD AND ABSORPTION TRENCH DETAILS

NOT TO SCALE

DRAWING No. 6



* DIFFERING GROUND SLOPES OVER SUBSURFACE DISPOSAL FIELD MAY REQUIRE USE OF VARIOUS COMBINATIONS OF FITTINGS.

Adapted from the Addendum to Part I Manual of Septic Tank Practice PHS Publication No. 526

SEPTIC TANK SYSTEMS

SERIAL DISTRIBUTION TILE FIELD FOR SLOPING GROUND

NOT TO SCALE

PART II

LARGER SYSTEMS

(schools, motels, restaurants, apartment houses, commercial premises, etc.)

The design of larger systems which will receive greater volumes and fluctuations in flow and strength of sewage should be entrusted to professional consulting engineers or architects having experience with these waste disposal systems in order to ensure satisfactory operation.

In addition to the septic tank and subsurface absorption method, there are effluent-producing treatment processes such as under-drained tile beds, lagoons and package treatment plants which may be more suitable for difficult soil conditions or greater volumes of sewage flow. These units will not be discussed in this booklet and the following data will refer only to the septic tank and subsurface absorption method.

The principles of operation and design for larger septic tank systems are similar to those for small domestic systems. The main difference is that the water usage per person and consequently the volume of sewage per person will vary according to the type of establishment. In order to determine the amount of sewage to be treated, it is necessary to know the maximum number of people in daily attendance and the average quantity of sewage flow to allow for each person. Table No. 4 gives typical range of sewage flow per person in Ontario for various types of institutions. These figures should be used with caution and modified where necessary if there is reason to suppose a greater or lesser water

Table No. 4

	Min.	Ave.	Max.	gallons per person per day
Swimming pools	10		15	" " "
Recreational areas for parks with washroom facilities	10		15	" " "
Golf and country clubs (non-resident)	10		15	" " "
Day schools	7	12	20	" " " †
Motels, tourist camps		35		" " "
*Domestic (with automatic washing machine but no garbage grinder)		60		" " "
Domestic (with automatic washing machine and garbage grinder)		72		" " "
Hospitals	150		250	gallons per bed

*This is the basis used in compiling the Table No. 2 on Drawing No. 3, Page 13.

usage might occur in a particular instance. For example, at a day school with a cafeteria and showers, 20 gallons per person per day might be used rather than the average of 12.

Knowing the number of people who will use the premises and the average sewage quantity per person, the total daily quantity of sewage to be treated can be found. The required liquid capacity of the septic tank is calculated as follows:

- For tanks up to 2,000 gallons capacity allow for 1½ times the daily flow.
- For tanks over 2,000 gallons capacity allow for three quarters of the daily flow and add 1,000 gallons.

These figures allow for the volume of sludge in the tank.

The area of the tile trenches required is found after carrying out the soil percolation test as described in Part I. The following table then enables the required length of 18-inch wide trench to be found. For trenches other than 18 inches wide the required length of tile run can be found by dividing the total volume of daily sewage flow by the chosen width of trench (in feet) and again dividing by the appropriate figure in the third column of the table.

†Note re peak flows: Each installation must be considered individually as the peak flows will be affected by local variables.

Table No. 5

Time "t" in minutes for water to fall 1"	Length in feet of 18 in. wide trench per 1,000 gallons of sewage	Loading of tank effluent in gallons per sq. ft. of trench bottom
1	160	4.2
5	350	1.9
10	510	1.3
20	740	0.9
30	830	0.8
40	950	0.7
50	1110	0.6
60	1330	0.5
over 60	Not suitable for subsurface absorption	

Intermittent dosing of the tile field by means of a siphon is recommended where the total length of field tile exceeds 500 feet.

Pumping will be necessary on a flat site where there is not enough fall to operate a siphon, or where the tile field is higher than the septic tank. For greater reliability, it is good practice to install two pumps

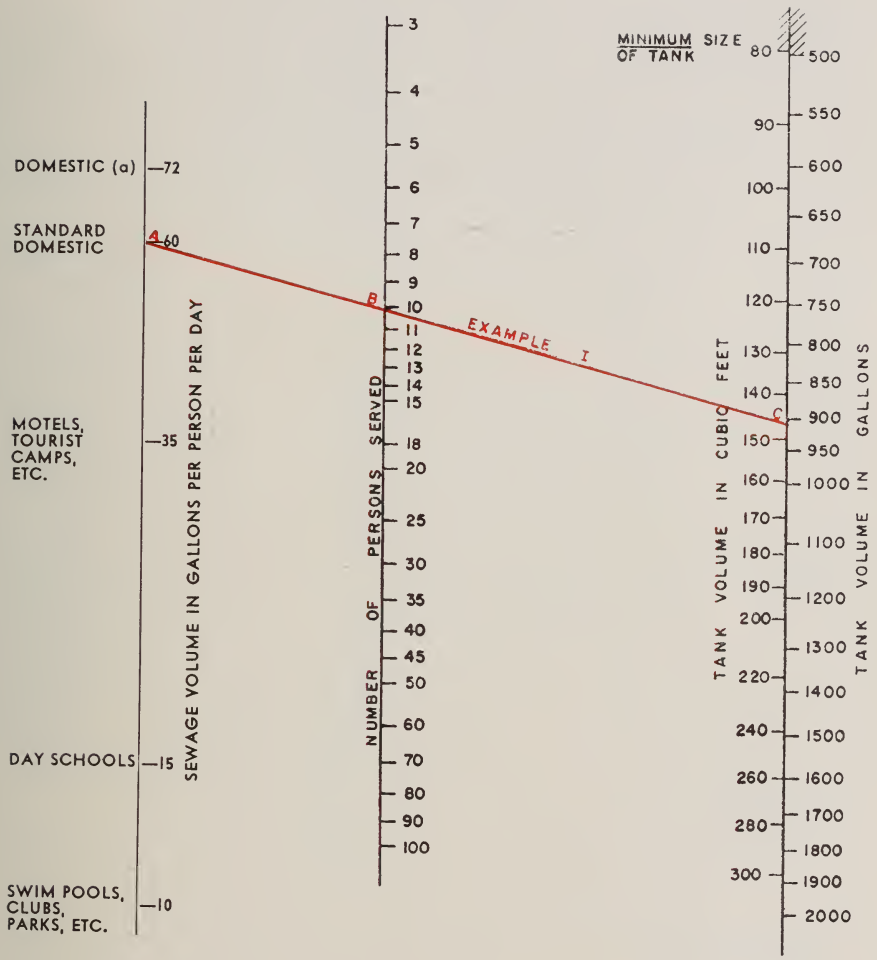
with the necessary automatic controls to operate them in turns. A pump failure alarm is usually included.

The charts on the following pages enable the essential design data to be read off directly, once the number of persons, the type of establishment and the time "t" in the soil percolation test are known. These charts can also be used to read off directly the adjustment necessary for dwellings which have garbage grinders.

If it is required to check these adjustments arithmetically, the following factors should be used:

- Septic tank capacity should be increased by one-fifth if a garbage grinder is used.
- The tile trench area should be increased by one-third if a garbage grinder is used.

CHART No. 1



Standard Domestic: Household with automatic washing machine but no garbage grinder.

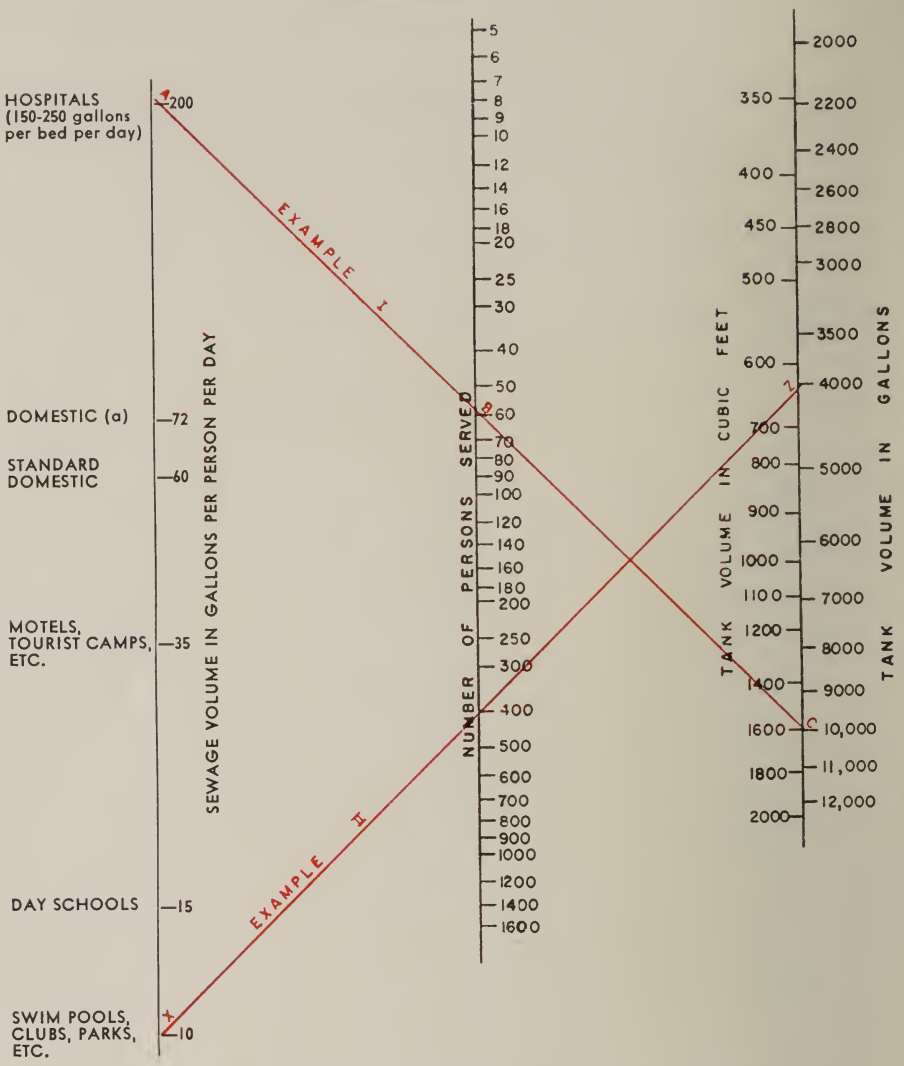
Domestic (a): Household with automatic washing machine and garbage grinder.

Example I: A household (A) with automatic washing machine but no garbage grinder for 10 people (B). Line through A and B to C. Read tank volume at C = 900 gallons or 144 cu. ft.

SEPTIC TANK SYSTEMS

SEPTIC TANK SELECTION
(FOR DOMESTIC AND OTHER SMALL TANKS UP TO 2000 GALLONS)

CHART No. 2



Standard Domestic: Household with automatic washing machine but no garbage grinder.

Domestic (a): Household with automatic washing machine and garbage grinder.

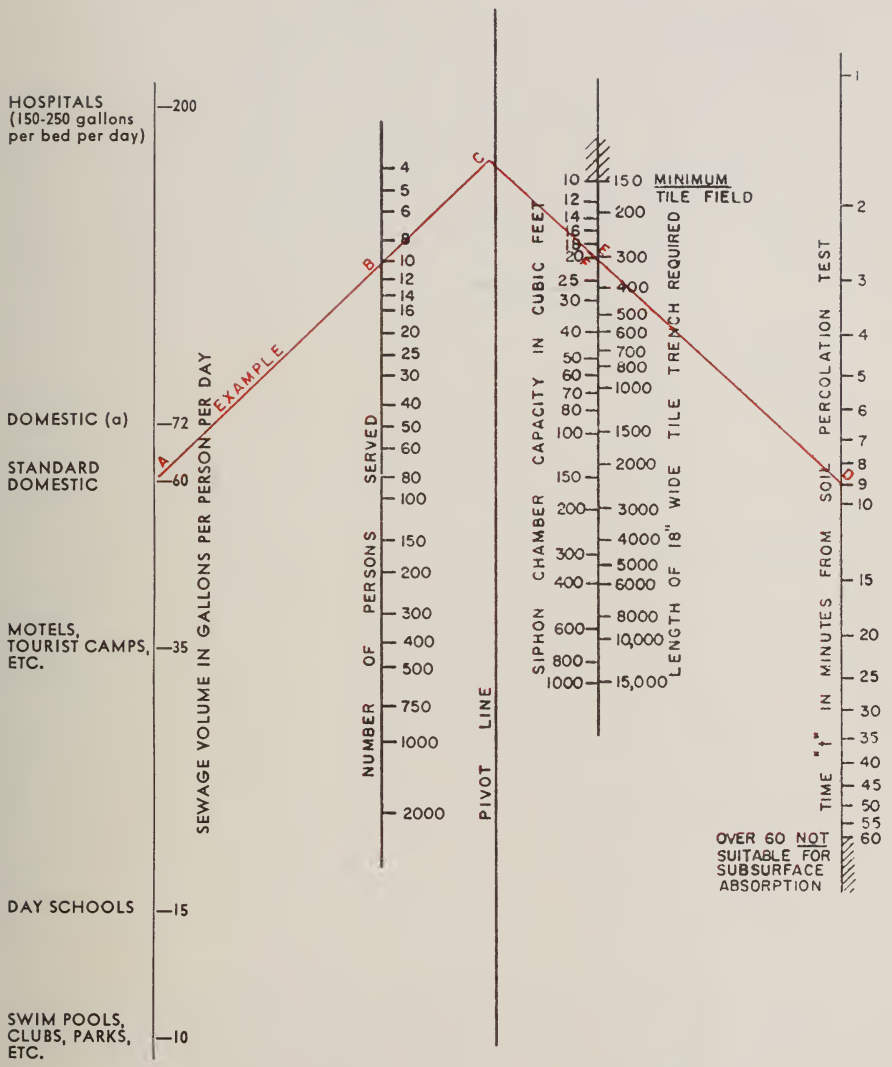
Example I: A hospital (A) for 60 patients (B). Line through A and B to C. Read tank volume at C = 10,000 gallons or 1600 cu. ft.

Example II: A swimming pool (X) for maximum daily bathing load of 400 people (Y). Line through X and Y to Z. Read tank volume at Z=4000 gallons or 640 cu. ft.

SEPTIC TANK SYSTEMS

SEPTIC TANK SELECTION
LARGER TANKS
(2000 GALLONS AND OVER)

CHART No. 3


HOSPITALS (150-250 gallons per bed per day)
—200
DOMESTIC (a)
—72
STANDARD DOMESTIC
—60
MOTELS, TOURIST CAMPS, ETC.
—35
DAY SCHOOLS
—15
SWIM POOLS, CLUBS, PARKS, ETC.
—10
SEWAGE VOLUME IN GALLONS PER PERSON PER DAY
EXAMPLE
A
B
C
D
E
F
NUMBER OF PERSONS SERVED
4 5 6 8 10 12 14 16 20 25 30 40 50 60 80 100 150 200 300 400 500 750 1000 2000
PIVOT LINE
SIPHON CHAMBER CAPACITY IN CUBIC FEET
10 12 14 16 18 20 25 30 40 50 60 70 80 100 150 200 300 400 600 800 1000
LENGTH OF 18" WIDE TILE TRENCH REQUIRED
150 MINIMUM TILE FIELD
200 300 400 500 600 700 800 1000 1500 2000 3000 4000 5000 6000 8000 10,000 15,000
TIME "t" IN MINUTES FROM SOIL PERCOLATION TEST
1 2 3 4 5 6 7 8 9 10 15 20 25 30 35 40 45 50 55 60
OVER 60 NOT SUITABLE FOR SUBSURFACE ABSORPTION

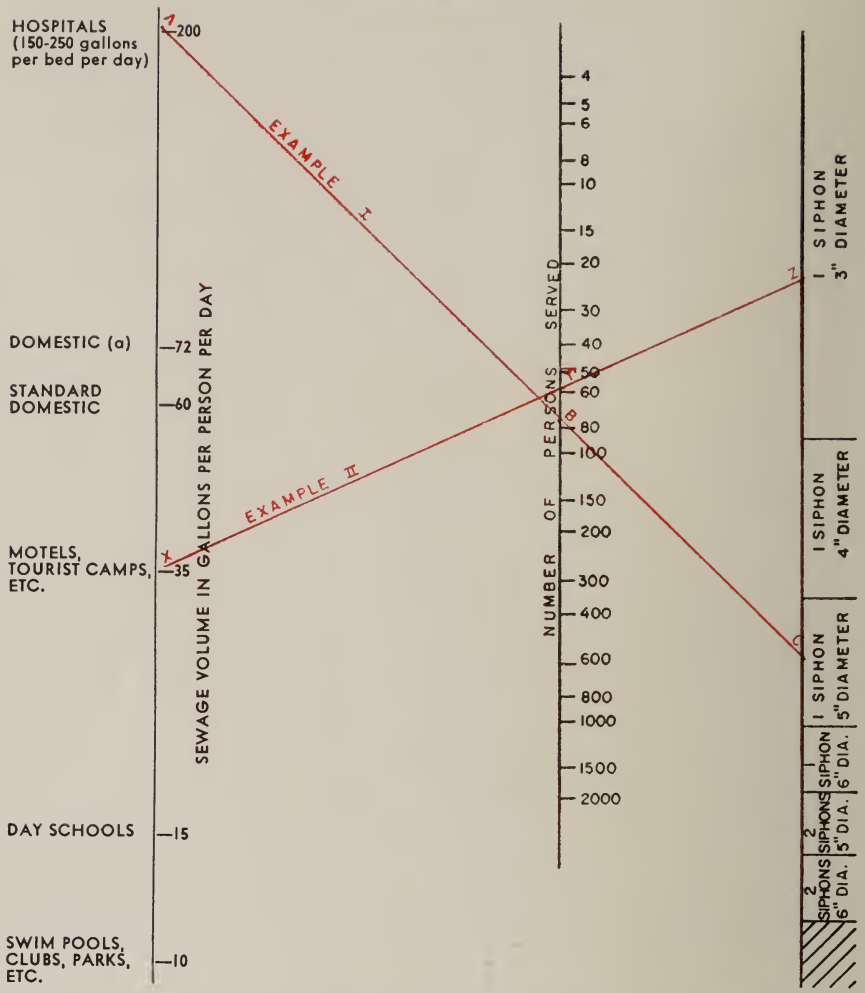
Standard Domestic: Household with automatic washing machine but no garbage grinder.

Domestic (a): Household with automatic washing machine and garbage grinder.

Example: A domestic household (A) for 10 persons (B). Soil percolation test time "t" of 9 minutes (D). Line through A and B to C on pivot line. Line through C to D. Read tile trench length at E = 300 ft., size of siphon chamber at F = 20 cu. ft.

SEPTIC TANK SYSTEMS
LENGTH OF 18" WIDE TILE TRENCH REQ'D AND CAPACITY OF SIPHON CHAMBER REQ'D (FOR 4" DIA. FIELD TILE)

CHART No. 4



Standard Domestic: Household with automatic washing machine but no garbage grinder.

Domestic (a): Household with automatic washing machine and garbage grinder.

N.B. Two siphons not interconnected in one chamber will work alternately and thus have the discharge rate of one siphon only. They must be interconnected if their combined discharge capacity is required. Consult the siphon manufacturer's instructions when installing. The siphon discharge capacity must be greater than the anticipated peak rate of sewage flow.

Example I: A hospital (A) for 80 patients (B). Line through A and B to C. Read siphon size at C = 1 siphon 5" diameter.

Example II. A motel (X) for 60 guests (Y). Line through X and Y to Z. Read siphon size at Z = 1 siphon 3" diameter.

SEPTIC TANK SYSTEMS

SIZE OF SIPHON REQUIRED

ONTARIO. MINISTRY OF ENVIRONMENT
PRIVATE WASTE AND WATER MGT. BR.

SEPTIC TANK SYSTEMS.
MOE/SEP/AROY

AROY

DATE	ISSUED TO
MAR 2 6 1979	G. ROSLER PMS
MAY 2 8 1979	Vic Davey WWT
SEP - 4 1979	Pam Hill
MAR 1 [illegible]	[illegible]
APR 2 6 1988	A.D. Clark

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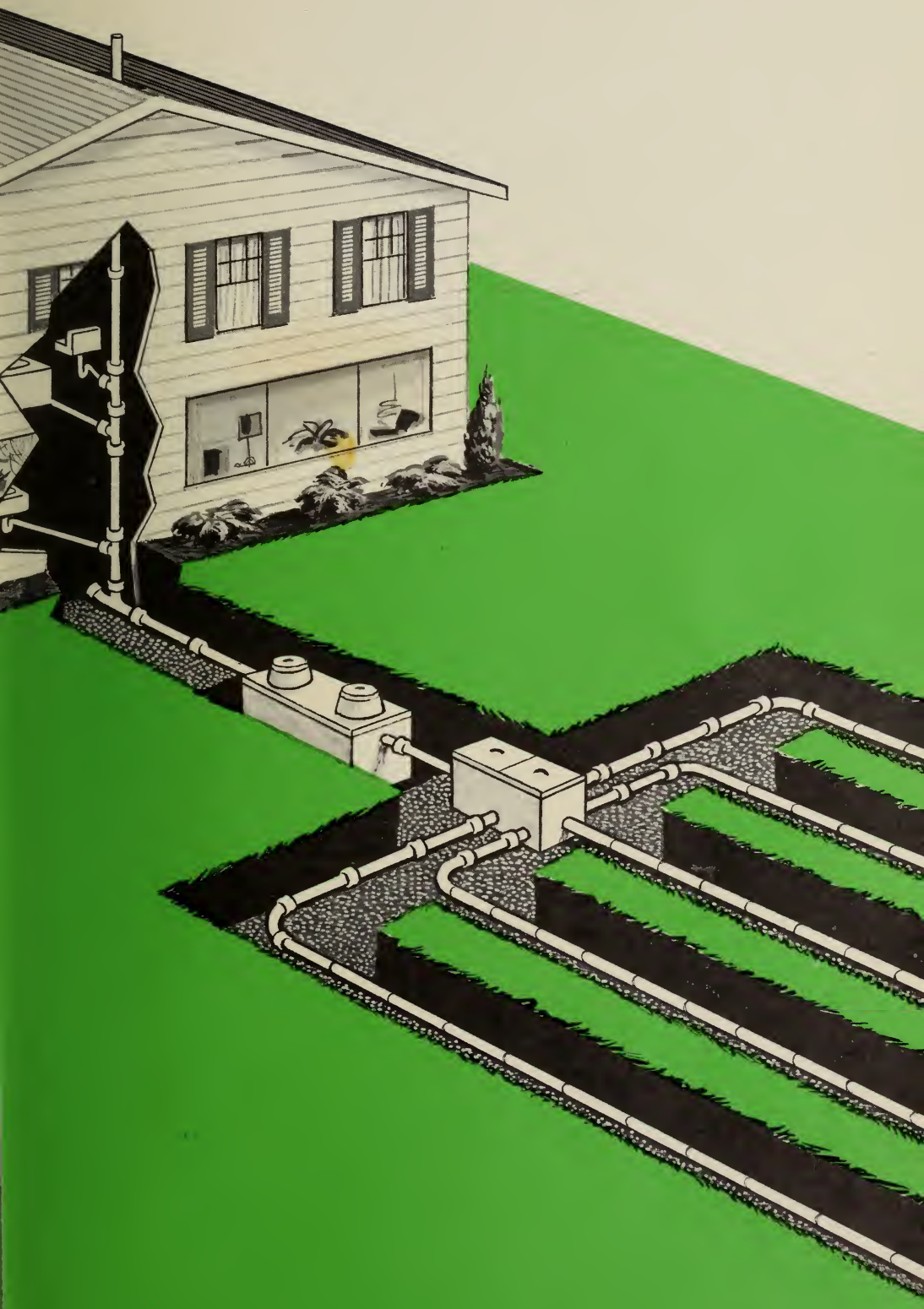

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